# U.S. Army Corps of Engineers Pittsburgh District

# Harmful Algae Blooms (HABs)

## About HABs

Freshwater harmful algal blooms (HABs) are significant and excessive growths of blue-green algae, also known as cyanobacteria. Native blue-green algae species inhabit freshwater lakes and are capable of producing HABs. When conditions are right, several of these species can produce toxic chemicals (called cyanotoxins) that are harmful to the nervous system (neurotoxins), the liver (hepatotoxins), and the skin (dermatoxins) of humans and other animals. In addition to cyanotoxins, HABs are very harmful to the lake ecosystem and can cause the depletion of dissolved oxygen levels through the processes of algal respiration at night and bacterial decomposition of dead algae. These decreased dissolved oxygen levels, and in some cases anoxic conditions, can create large fish kills.

General contributing factors that promote the formation of HABs are:

- Excessive nutrients (nitrogen and phosphorus)
- Clear, sunny days
- Warm temperatures
- Low-water or low-flow conditions

Although some HABs occur during the cold seasons, they most frequently occur during the summer when temperatures are high, skies are clear, and the flow of incoming water is low. Two of the most influential factors of HAB growth are the concentration and bioavailability of nutrients such as nitrogen and phosphorus. Nitrogen and phosphorus are both required by blue-green algae to live and can be scarce in the environment, thereby limiting growth. When the limiting nutrient becomes available in the ecosystem, algae populations increase dramatically resulting in a bloom. Most nitrogen and phosphorus pollution (also known as nutrient overloading) comes from the runoff of agricultural fertilizer, lawn fertilizer, untreated human sewage (storm overflows), and untreated animal sewage from concentrated animal feeding operations.

## Monitoring for HABs

Water quality authority for monitoring HABs rests with the individual states where the lake projects are located. While the Pittsburgh District monitors water quality as it relates specifically to our lakes, it is the responsibility and authority of each state to establish water quality criteria and standards with regard to algal cell counts, algal toxins, and all other substances found in water.

In those states where a HAB strategy is not developed or, due to geographic boundaries, does not address the entire lake body; the Pittsburgh District has been directed to develop their own HAB response plans. In these cases, the Pittsburgh District uses the World Health Organization (WHO) guidelines as the basis for decisions regarding HABs. The WHO guidelines are based on cell counts. While there are tests available that examine the amount of toxins produced, there are no widely accepted guidelines that establish safe levels of toxins for recreational waters. In addition, these tests can measure liver and nerve toxins but there are no commonly available tests to measure levels of skin toxins, which most BGA (blue green algae/cyanobacteria) produce.

For the lakes located in states that have developed their own HAB Response Plans; the algae levels may be determined using toxin analysis instead of cell counts (Ohio lake projects) or they may employ the use of both toxin analysis and cell counts.

## Cyanobacteria Threshold Values

The Pittsburgh District has adopted cyanobacteria threshold values from the World Health Organization's "Guidelines for Safe Recreational Water Environments" (see Chapter 8 under the link "WHO Guidelines"). These values reflect the minimum level at which the Pittsburgh District will classify a HAB and what actions will be taken. These values are measured as the number of cells of cyanobacteria per milliliter of water (cells/mL). HAB ADVISORY's and CAUTION's are lifted once cell counts decline below the threshold values.

| Cyanobacterial cell count | Health Risk | Classification |
|---|---|---|
| Exceed 20,000 cells/mL | **Low probability of adverse health effects.**<br>*Short-term adverse health outcomes, e.g., skin irritations, gastrointestinal illness.* | HAB ADVISORY |
| Exceed 100,000 cells/mL | **Moderate probability of adverse health effects.**<br>*Potential for long-term illness with some cyanobacterial species.*<br>*Short-term adverse health outcomes, e.g., skin irritations, gastrointestinal illness.* | HAB CAUTION |

{This table is adapted from the World Health Organization's "Guidelines for Safe Recreational Water Environments" Chapter 8.}

## Public Relevance

Counts above 20,000 cells per milliliter, but below 100,000 cells per milliliter, require advisory alert information to be physically posted in the area for the public. An advisory indicates a HAB is present and a relatively low probability of experiencing adverse health effects. In these cases the public should exercise caution and consider adverse health effects of a HAB while boating or swimming.

Counts above 100,000 cells per milliliter require caution advisory information to be physically posted in the area for the public. A caution indicates a HAB is present and a moderate probability of experiencing adverse health effects exists. The public must exercise caution and consider adverse health effects of a HAB while recreating in lake water.

Precautionary measures include:

- Avoiding contact with visible algae and not swallowing water while swimming.
- Taking a bath or shower with warm, soapy water after coming in contact with water in ponds and lakes, especially before preparing or consuming food.
- Not allowing pets or livestock to swim in or drink untreated water from these sources. Livestock, pets and wild animals can be poisoned by the toxins produced by some algal blooms. Small animals can ingest a toxic dose quickly.
- Dogs are particularly susceptible to blue-green algae poisoning because the scum can attach to their coats and be swallowed during self-cleaning.
- Remove fish skin and organs before cooking, do not consume or allow pets/animals to consume the organs or skin.

Visitors to a lake experiencing a HAB must consider risks before participating in water-related activities. Visitors who swim, boat or enter the water are at higher risk to experience adverse health effects if they come in contact with water from the lake. Exposure to blue-green algae during recreational activities such as swimming, wading, and water-skiing or boating, have resulted in rashes, skin, eye irritation, and other uncomfortable effects such as nausea, stomach aches, and tingling in fingers and toes. Effects to the skin can develop fairly quickly. Most blue-green algae produce skin toxins which may cause rash, nausea, diarrhea, vomiting, upper respiratory symptoms, and other flu-like symptoms. Some but not all blue-green algae blooms produce nerve and liver toxins, which are extremely dangerous. Wash all clothing and equipment including life jackets after contact with algal blooms and scum. Use fresh water to wash life jackets and use soap as an additional precaution. Algal cells can accumulate under swimwear so it is especially important to rinse clothing and skin with fresh water and soap.

If a lake provides water to local water/utility companies, the utility companies are notified of the HAB so that they can take precautionary measures in treating the drinking water. For specific inquiries about your drinking water quality, contact your utility office.

## Monitoring Schedule and Sample Analysis

The Pittsburgh District is working with each state where our lake projects are located. Each state serves as the water quality authority and regulatory agency. However, as part of the Pittsburgh District HAB plan, the monitoring schedules are based on which lakes are experiencing a HAB and how long it lasts. For lake specific details of monitoring schedules please contact the Pittsburgh District Water Quality Team at 412-395-7300.

**Aquatic Analysts** is the lab contracted by the Pittsburgh District to perform algae analysis.

## More Information and Reporting HABs

For more information about HABs in the Pittsburgh District, please contact the Water Quality Team with the Pittsburgh District. The Ohio algae info link has updated information about HABs in Ohio lakes.

**If you see signs of a potential HAB and want to report it**, please contact the Pittsburgh District Water Quality Team by email at LRP-WaterQuality@usace.army.mil or call (412) 395-7300.

To report a HAB in the state of Ohio, go to the Ohio algae info link and fill out the Bloom Report Form.

U.S. EPA CyanoHABs
http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/cyanohabs.cfm
World Health Organization Guidelines
http://www.epa.state.oh.us/dsw/HAB.aspx
Ohio algae information
http://www.epa.state.oh.us/dsw/HAB.aspx